Summary of Projection Methodology

Introduction.

In 1975, a group of state and local agencies joined together in an attempt to bring some degree of sanity to the projection process. At that time, many of these agencies (or their consultants) produced separate projection series.

The problem faced by planners and policy makers alike was in choosing among the projection series available. This led to inconsistencies in the execution of policy where one set was used for traffic planning, another for water demand analysis, and a third for school enrollment or health planning. This is the same problem that was faced by DEFAC (Delaware Economic and Financial Advisory Council) in preparing revenue forecasts for the Governor and the General Assembly. Members of the General Assembly forced the abandonment of the range concept in favor of a "best guess" or "most likely" outcome. The general opinion was that ranges permit the manipulation of the data to fit the user's purposes. That was the guiding force behind the "joint" production of population estimates.

After producing projection series in 1975, 1978 and 1982, the Consortium decided to try to bring coherence to the employment projection series and more importantly, to make sure that the population forecasts and employment forecasts were consistent. The general logic was that you cannot have population growth without employment opportunity in the long-run. That decision led to the basic framework of the projection model that is currently used and is a departure from the more common approach which had been used prior to 1984.

In the final analysis, the quality of the projections depends on the quality of the assumptions chosen by those making the projections. In this paper we will explain the

assumptions used and the projection process to which they are the primary input.

The Model.

The projection process begins with the 1980 age-sex distribution (obtained from the Census) for the jurisdiction being projected. In earlier years this distribution began with the five-year cohort 0-4 and ended with the 75&over age group. This year, the detail has been expanded so that the last group is now 85&over.

The first step in the process is to age each age-sex cohort by five years. In doing so, a certain number of deaths must be accounted for. A five year survival rate is used to account for these deaths. Applying the survival rate to the 0-4 age group gives the number of those persons alive in that age group in 1980 that will constitute the 5-9 age group in 1985. This procedure is followed until all age groups have been filled with the exception of the birth cohort (0-4 in 1985).

The 0-4 age group in 1985 will be formed from all of those persons born during the 1980-1985 period. We estimate this by applying an annual birth rate for females in each separate age group beginning with 10-14 and ending with 45-49. The projected of births are then survived to 1985.

This procedure can then be applied for each subsequent time period 1985-1990, 1990-1995, and so on. The result would be an estimate with the assumption of zero net-migration. Unfortunately, that is rarely the case and thus we must attempt to account for migration.

The typical procedure used to adjust the projection for net-migration is to calculate a migration rate for each age-sex category for some past time period e.g. 1970-1980 or 1975-1980, and to make assumptions about how those rates will change in the future. In order to integrate the

employment projections with the population projections we have chosen a variant of the usual procedure.

If we forecast employment using some economic model, then the population must be sufficient to provide the laborforce to fill that employment. If the current population is too low, net in-migration is forecasted. If the forecasted population is too high, out-migration will occur. In either case, the migration rates from the past are modified proportionally to permit the employment forecasts and the population forecasts to balance. These modified migration rates are then applied to the survived population for each five-year period. The actual amount of migration is an output of the calculation. If this number seems too high then adjustments must be made to the employment forecasts or to one of the other assumptions in the laborforce estimate.

This is the basic core of the model that was used to produce the attached projections.

Mortality.

The survival rates currently used in the model are attached. They are based on age by sex, five year survival rates provided by the Bureau of Census in their projection series (1983 to 2080). These rates are the middle mortality assumptions. Using these as a base, they were scaled proportionally to produce the number of deaths actually observed in the State in the period 1980-1985. Thus, although they are national figures they do relect accurately Delaware conditions. The same set of assumptions were applied to all jurisdictions in the State.

Fertility.

The asuumptions for birth rates were derived from data supplied by the Bureau of Census in their projection series. These estimates were also scaled proportionally to produce the observed number of births during the 1980-1985 calibration period. The table is attached.

Institutional Populations.

In order to avoid forecasting births from females in the University population we have chosen to exclude part of the University from all of these projections. For affected jurisdictions, they are simply removed at the beginning and added in at the end. The differential treatment of the University dormitory population was made necessary since very different birth rates and labor force participation rates apply to this population. For those living off-campus the data were simply not available. The University's student body is over 17,000 of which approximately 8,800 live on campus. It would be expected that the others would be somewhat different than the general population.

This has in fact led to difficulties in forecasting school enrollment in the Greater Newark area. For the State and New Castle County, we must assume that any bias caused by excluding students who will ultimately live and work in Delaware is offset with the inclusion of out-of-state students who live off campus. It is a difficult population.

Laborforce.

In order to balance the employment forecast with the population projection we have to calculate resident employment. That requires a number of assumptions. The first set of assumptions are taken from the Bureau of Labor Statistics. Those give us laborforce participation rates for each age-sex cohort from 1985 through 2010. They are projections themselves. Applying these assumptions allows us to derive a theoretical laborforce. To that laborforce is applied the same assumption on unemployment that was used in generating the employment forecasts. The result is employment by place of residence. From that projection an estimate of jobs is derived, to which adjustments are made for self-employment, agricultural jobs, and multiple job holders. The result is resident jobs, totally derived from the population projection.

We use the Delmarva Power and Light Company's employment forecast as a starting point from the employment side. A single adjustment is required to reach an estimate for resident jobs and that is in-commuting.

In-commuting is a difficult parameter and it is the weakest part of the entire projection process. Our primary source is the UTPP file provided by the Bureau of Census. It measures commuting at one point in time namely the 1980 Census. Further, commuting in Kent and Sussex counties is not separable. We also have conflicting data from the Bureau of Economic Analysis and the Division of Revenue which further complicates the matter. Fortunately, the size of this part of the laborforce is relatively small and should not by itself impact the overall process.

Adjustments.

This set of projections is a starting point and must be carefully reviewed annually. There are a number of sources which can be used to adjust the path of the projection without going through a major revision. First, the annual population estimates (not forecasts) provided by the Federal-State-Local cooperative are useful for overall monitoring. Second, actual birth and death statistics issued by NCHS and the State Bureau of Vital Statistics are quite valuable. Third, school enrollment data, medicare enrollment data and the current population survey can help with structural changes in the age-groups. Finally, data from the State Department of Labor can help spot changes in the path of employment. It is imperative that these indicators be tracked and that the projections be modified annually.

University of Delaware
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Census and Data System

Population Projection System
Consortium Series

State of Delaware

	1980	1985	1990	1995	2000	2005	2010
Population	594338	622820	667480	714670	753410	782490	811690
Labor Force		315132	345701	374848	399199	416391	430507
Employed Persons		298115	333256	361354	385626	401818	415439
Jobs		313020	349919	379421	404907	421908	436211
Self-employed		16000	17400	19100	20800	22000	22500
Agricult. emp		7500	7000	6800	6600	6400	6200
Resident Jobs		289520	325519	353521	377507	393508	407511
Births		45661	47590	49702	48024	46439	46895
Deaths		23052	26077	28148	30257	32406	34921
Net Migrants		5919	23086	25658	20969	15009	17270
Households		227573	250532	271577	289416	305913	324163
Net New Units		20100	23000	21000	17800	16500	18200
Proj. Employment		298000	335000	366000	388000	404000	418000
Net Commuting		8500	9500	12500	10500	10500	10500
Resident Emp.		289500	325500	353500	377500	393500	407500

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Population Projection System
Consortium Series

State of Delaware

	1980	1985	1990	1995	2000	2005	2010
0 - 4	41151	45670	49210	51510	49280	47170	47820
5 - 9	42076	41570	47700	51470	53320	50470	48490
10 - 14	48870	42540	43460	49940	53330	54660	51930
15 - 19	59748	53360	48430	49450	55690	58620	60180
20 - 24	58123	60900	56150	51080	51670	57540	60730
25 - 29	49622	53680	58370	53510	47740	47840	54030
30 - 34	45414	49920	55820	60810	55190	48720	49000
35 - 39	37070	45670	51900	58140	62690	56300	49900
40 - 44	31198	37180	47340	53910	59800	63820	57540
45 - 49	30910	31100	38300	48910	55160	60580	64900
50 - 54	32300	30490	31720	39200	49600	55410	61110
55 - 59	31847	30970	29250	30490	37780	47910	53560
60 - 64	26830	29940	29110	27570	28840	35830	45510
65 - 69	21209	24410	27260	26610	25290	26570	33090
70 - 74	15421	18490	21230	23870	23400	22360	23580
75 - 79	10471	12600	15170	17490	19840	19570	18800
80 - 84	6809	7750	9260	11330	13200	15180	15070
85 & up	5269	6580	7800	9380	11590	13940	16450
Totals	594338	622820	667480	714670	753410	782490	811690

University of Delaware
College of Urban Affairs and Public Policy
Census and Data System

Population Projection System
Consortium Series

State of Delaware

	1980	1985	1990	1995	2000	2005	2010
				MALES			
0 - 4	20984	23390	25200	26380	25240	24160	24490
5 - 9	21441	21190	24420	26350	27300	25840	24830
10 - 14	24895	21670	22150	25560	27300	27980	26580
15 - 19	29572	26760	24250	24780	28070	29570	30370
20 - 24	28339	30240	28270	25700	26010	29110	30740
25 - 29	24242	26230	29080	27080	24170	24230	27490
30 - 34	22144	24320	27200	30220	27860	24600	24760
35 - 39	18043	22210	25220	28260	31080	28360	25150
40 - 44	15185	18040	22960	26120	28990	31560	28920
45 - 49	14986	15070	18500	23620	26620	29260	31980
50 - 54	15660	14670	15250	18800	23790	26580	29340
55 - 59	15051	14820	13890	14480	17920	22750	25440
60 - 64	12741	13860	13650	12840	13460	16720	21270
65 - 69	9142	11220	12210	12100	11440	12060	15030
70 - 74	6647	7550	9270	10160	10140	9650	10230
75 - 79	3695	5030	5720	7090	7840	7890	7560
80 - 84	2403	2440	3320	3820	4810	5390	5470
85 & up	1429	1820	1990	2560	3100	3900	4590
				FEMALES			
0 - 4	20167	22280	24010	25130	24040	23010	23330
5 - 9	20635	20380	23280	25120	26020	24630	23660
10 - 14	23975	20870	21310	24380	26030	26680	25350
15 - 19	30176	26600	24180	24670	27620	29050	29810
20 - 24	29784	30660	27880	25380	25660	28430	29990
25 - 29	25380	27450	29290	26430	23570	23610	26540
30 - 34	23270	25600	28620	30590	27330	24120	24240
35 - 39	19027	23460	26680	29880	31610	27940	24750
40 - 44	16013	19140	24380	27790	30810	32260	28620
45 - 49	15924	16030	19800	25290	28540	31320	32920
50 - 54	16640	15820	16470	20400	25810	28830	31770
55 - 59	16796	16150	15360	16010	19860	25160	28120
60 - 64	14089	16080	15460	14730	15380	19110	24240
65 - 69	12067	13190	15050	14510	13850	14510	18060
70 - 74	8774	10940	11960	13710	13260	12710	13350
75 - 79	6776	7570	9450	10400	12000	11680	11240
80 - 84	4406	5310	5940	7510	8390	9790	9600
85 & up	3840	4760	5810	6820	8490	10040	11860

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Population Projection System
Consortium Series

Kent County

	1980	1985	1990	1995	2000	2005	2010
Population	98219	102560	106220	117070	125070	131680	139650
Labor Force		53055	56607	63726	68817	72446	76389
Employed Persons		50190	54569	61432	66477	69911	73715
Jobs		52700	57297	64504	69801	73406	77401
Self-employed		2400	2600	2800	3100	3300	3400
Agricult. emp		1800	1700	1700	1700	1600	1500
Resident Jobs		48500	52997	60004	65001	68506	72501
Births		8073	8383	8305	8297	8136	8240
Deaths		3432	3810	4051	4386	4757	5239
Net Migrants		-315	-902	6610	4065	3253	4955
Households		36275	39220	43880	47773	51370	55717
Net New Units		3800	2900	4700	3900	3600	4300
Proj. Employment		47000	51000	57500	62500	66000	70000
Net Commuting		-1500	-2000	-2500	-2500	-2500	-2500
Resident Emp.		48500	53000	60000	65000	68500	72500

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Population Projection System
Consortium Series

Kent County

	1980	1985	1990	1995	2000	2005	2010
0 - 4	7920	7950	8180	8820	8550	8320	8550
5 - 9	7863	7870	7830	8770	9180	8810	8710
10 - 14	8538	7820	7770	8400	9130	9460	9240
15 - 19	10177	8480	7700	8320	8730	9410	9890
20 - 24	10465	10080	8340	8230	8620	8970	9820
25 - 29	8335	10360	9900	8900	8530	8860	9360
30 - 34	7764	8250	10170	10570	9220	8760	9240
35 - 39	6374	7680	8090	10860	10950	9460	9130
40 - 44	5365	6290	7520	8620	11210	11210	9850
45 - 49	4610	5280	6190	7960	8860	11430	11610
50 - 54	4817	4490	5150	6490	8110	8950	11730
55 - 59	4080	4620	4310	4940	6250	7820	8660
60 - 64	3419	3840	4340	4060	4680	5930	7440
65 - 69	2921	3120	3500	3960	3720	4310	5470
70 - 74	2123	2540	2710	3060	3480	3280	3820
75 - 79	1539	1730	2080	2230	2550	2910	2760
80 - 84	1001	1130	1270	1550	1690	1950	2230
85 & up	908	1030	1170	1330	1610	1840	2140
Totals	98219	102560	106220	117070	125070	131680	139650

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Population Projection System
Consortium Series

Kent County

	1980	1985	1990	1995	2000	2005	2010
			MALES				
0 - 4	4088	4070	4190	4520	4380	4260	4380
5 - 9	4006	4060	4010	4490	4700	4510	4460
10 - 14	4356	3980	4010	4300	4670	4840	4730
15 - 19	5186	4320	3920	4290	4460	4810	5060
20 - 24	5360	5120	4240	4180	4430	4580	5010
25 - 29	4050	5290	5020	4510	4320	4540	4760
30 - 34	3833	4000	5180	5340	4660	4420	4730
35 - 39	3121	3780	3910	5520	5520	4770	4600
40 - 44	2627	3070	3690	4150	5680	5640	4960
45 - 49	2284	2570	3010	3890	4250	5770	5820
50 - 54	2387	2210	2490	3130	3940	4270	5890
55 - 59	1898	2260	2090	2360	2980	3760	4090
60 - 64	1629	1750	2080	1930	2200	2780	3520
65 - 69	1299	1440	1540	1840	1720	1970	2500
70 - 74	944	1070	1190	1280	1540	1450	1670
75 - 79	568	710	810	910	990	1200	1140
80 - 84	370	370	470	540	620	680	830
85 & up	248	290	310	370	450	520	590
			FEMALES				
0 - 4	3832	3880	3990	4300	4170	4060	4170
5 - 9	3857	3810	3820	4280	4480	4300	4250
10 - 14	4182	3840	3760	4100	4460	4620	4510
15 - 19	4991	4160	3780	4030	4270	4600	4830
20 - 24	5105	4960	4100	4050	4190	4390	4810
25 - 29	4285	5070	4880	4390	4210	4320	4600
30 - 34	3931	4250	4990	5230	4560	4340	4510
35 - 39	3253	3900	4180	5340	5430	4690	4530
40 - 44	2738	3220	3830	4470	5530	5570	4890
45 - 49	2326	2710	3180	4070	4610	5660	5790
50 - 54	2430	2280	2660	3360	4170	4680	5840
55 - 59	2182	2360	2220	2580	3270	4060	4570
60 - 64	1790	2090	2260	2130	2480	3150	3920
65 - 69	1622	1680	1960	2120	2000	2340	2970
70 - 74	1179	1470	1520	1780	1940	1830	2150
75 - 79	971	1020	1270	1320	1560	1710	1620
80 - 84	631	760	800	1010	1070	1270	1400
85 & up	660	740	860	960	1160	1320	1550

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Population Projection System
Consortium Series

New Castle County

	1980	1985	1990	1995	2000	2005	2010
Population	398115	414310	436080	463000	482910	499140	510900
Labor Force		209618	224174	239578	251901	261841	266963
Employed Persons		198299	216103	230954	243337	252677	257620
Jobs		208214	226909	242501	255503	265311	270501
Self-employed		10400	11300	12400	13500	14300	14600
Agricult. emp		2200	2100	2100	2000	2000	1900
Resident Jobs		195614	213509	228001	240003	249011	254001
Births		30796	31458	31827	30232	28863	29280
Deaths		14899	16983	18403	19875	21346	23041
Net Migrants		286	7320	13465	9602	8659	5572
Households		151416	164042	176297	185795	195418	204573
Net New Units		12500	12600	12300	9500	9600	9200
Proj. Employment		205600	225000	242000	253000	262000	267000
Net Commuting		10000	11500	14000	13000	13000	13000
Resident Emp.		195600	213500	228000	240000	249000	254000

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Population Projection System
Consortium Series

New Castle County

	1980	1985	1990	1995	2000	2005	2010
0 - 4	26607	30460	31770	32710	30710	29250	29440
5 - 9	27353	26580	31080	32970	33520	31390	29660
10 - 14	32303	27340	27140	32260	33810	34290	31840
15 - 19	40775	36270	31910	32160	37070	38570	38760
20 - 24	39952	41370	37580	33610	33530	38450	39680
25 - 29	33854	34980	37180	33880	29430	29270	34000
30 - 34	30703	33680	35550	38410	34580	29970	29560
35 - 39	25000	30530	34200	36710	39200	35210	30260
40 - 44	21039	24780	30910	35230	37380	39830	35480
45 - 49	21224	20730	24950	31670	35680	37800	39940
50 - 54	22180	20700	20650	25320	31800	35770	37600
55 - 59	21956	21270	19850	19860	24400	30720	34570
60 - 64	17729	20640	20000	18720	18780	23150	29190
65 - 69	13488	16140	18790	18270	17170	17310	21370
70 - 74	9808	11770	14030	16440	16060	15180	15360
75 - 79	6617	8030	9660	11570	13660	13440	12760
80 - 84	4302	4910	5900	7240	8730	10440	10350
85 & up	3225	4130	4930	5970	7400	9100	11080
Totals	398115	414310	436080	463000	482910	499140	510900

University of Delaware
College of Urban Affairs and Public Policy
Census and Data System

Population Projection System
Consortium Series

New Castle County

	1980	1985	1990	1995	2000	2005	2010
				MALES			
0 - 4	13579	15600	16270	16750	15730	14980	15080
5 - 9	13940	13560	15910	16880	17160	16070	15190
10 - 14	16476	13930	13840	16510	17310	17550	16300
15 - 19	19986	18080	15850	15990	18550	19320	19420
20 - 24	19170	20400	18860	16830	16810	19370	20000
25 - 29	16531	16830	18440	17170	14900	14840	17100
30 - 34	14843	16400	17060	19000	17480	15140	14950
35 - 39	12124	14720	16610	17570	19350	17760	15250
40 - 44	10203	11980	14860	17060	17840	19610	17850
45 - 49	10292	10010	12010	15160	17210	17970	19590
50 - 54	10756	9960	9890	12100	15120	17150	17770
55 - 59	10478	10180	9430	9400	11530	14460	16410
60 - 64	8385	9650	9380	8720	8730	10760	13520
65 - 69	5681	7390	8500	8310	7770	7830	9670
70 - 74	4131	4690	6100	7070	6960	6550	6640
75 - 79	2254	3130	3550	4670	5460	5420	5130
80 - 84	1465	1490	2060	2380	3170	3750	3760
85 & up	882	1120	1220	1580	1920	2520	3110
				FEMALES			
0 - 4	13028	14860	15500	15960	14980	14270	14360
5 - 9	13413	13020	15170	16090	16360	15320	14470
10 - 14	15827	13410	13300	15750	16500	16740	15540
15 - 19	20789	18190	16060	16170	18520	19250	19340
20 - 24	20782	20970	18720	16780	16720	19080	19680
25 - 29	17323	18150	18740	16710	14530	14430	16700
30 - 34	15860	17280	18490	19410	17100	14830	14610
35 - 39	12876	15810	17590	19140	19850	17450	15010
40 - 44	10836	12800	16050	18170	19540	20220	17630
45 - 49	10932	10720	12940	16510	18470	19830	20350
50 - 54	11424	10740	10760	13220	16680	18620	19830
55 - 59	11478	11090	10420	10460	12870	16260	18160
60 - 64	9344	10990	10620	10000	10050	12390	15670
65 - 69	7807	8750	10290	9960	9400	9480	11700
70 - 74	5677	7080	7930	9370	9100	8630	8720
75 - 79	4363	4900	6110	6900	8200	8020	7630
80 - 84	2837	3420	3840	4860	5560	6690	6590
85 & up	2343	3010	3710	4390	5480	6580	7970

University of Delaware
College of Urban Affairs and Public Policy
Census and Data System

Population Projection System
Consortium Series

Sussex County

	1980	1985	1990	1995	2000	2005	2010
Population	98004	106060	125070	135970	145440	151960	161440
Labor Force		52454	64909	72417	78483	82119	87152
Employed Persons		49622	62572	69810	75815	79244	84102
Jobs		52103	65701	73300	79605	83207	88307
Self-employed		3200	3500	3800	4200	4400	4500
Agricult. emp		3500	3200	3000	2900	2800	2800
Resident Jobs		45403	59001	66500	72505	76007	81007
Births		6791	7736	9575	9684	9510	9405
Deaths		4720	5285	5700	6017	6314	6655
Net Migrants		5972	16578	7010	5811	3298	6763
Households		39909	47251	51872	55920	59247	63946
Net New Units		4000	7300	4600	4000	3300	4700
Proj. Employment		45400	59000	66500	72500	76000	81000
Net Commuting		0	0	0	0	0	0
Resident Emp.		45400	59000	66500	72500	76000	81000

University of Delaware
College of Urban Affairs and Public Policy
Census and Data System

Population Projection System
Consortium Series

Sussex County

	1980	1985	1990	1995	2000	2005	2010
0 - 4	6624	7250	9190	10120	10090	9680	9860
5 - 9	6860	7150	8700	9810	10640	10370	10230
10 - 14	8029	7400	8570	9300	10320	10940	10960
15 - 19	8796	8650	8870	9140	9760	10580	11540
20 - 24	7706	9460	10350	9440	9580	9990	11150
25 - 29	7433	8280	11300	11000	9880	9810	10520
30 - 34	6947	7980	9890	12010	11510	10120	10320
35 - 39	5696	7450	9530	10510	12570	11780	10640
40 - 44	4794	6100	8880	10110	10980	12840	12380
45 - 49	5075	5100	7220	9360	10500	11150	13410
50 - 54	5304	5350	5980	7540	9630	10570	11560
55 - 59	5811	5080	5120	5740	7260	9300	10210
60 - 64	5682	5460	4790	4830	5430	6880	8830
65 - 69	4800	5170	4980	4370	4440	5000	6360
70 - 74	3490	4180	4490	4370	3850	3930	4440
75 - 79	2315	2850	3420	3700	3630	3230	3310
80 - 84	1506	1710	2080	2540	2790	2790	2490
85 & up	1136	1440	1710	2080	2580	3000	3230
Totals	98004	106060	125070	135970	145440	151960	161440

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Consortium Series

Sussex County

	1980	1985	1990	1995	2000	2005	2010
				MALES			
0 - 4	3317	3710	4710	5180	5170	4960	5050
5 - 9	3495	3580	4450	5020	5450	5310	5240
10 - 14	4063	3770	4290	4760	5280	5600	5610
15 - 19	4400	4370	4510	4570	4990	5410	5900
20 - 24	3809	4720	5220	4790	4780	5100	5690
25 - 29	3661	4080	5620	5530	5000	4880	5350
30 - 34	3468	3920	4860	5960	5770	5110	5120
35 - 39	2798	3710	4670	5150	6220	5890	5360
40 - 44	2355	2990	4410	4940	5370	6340	6180
45 - 49	2409	2490	3520	4630	5110	5430	6600
50 - 54	2518	2520	2900	3650	4730	5110	5600
55 - 59	2675	2380	2380	2750	3480	4520	4890
60 - 64	2727	2460	2200	2200	2560	3240	4230
65 - 69	2162	2400	2170	1940	1960	2290	2920
70 - 74	1572	1790	1980	1810	1630	1660	1950
75 - 79	873	1190	1350	1520	1390	1270	1300
80 - 84	568	580	780	900	1030	960	880
85 & up	299	420	470	600	730	860	880
				FEMALES			
0 - 4	3307	3540	4480	4940	4920	4720	4810
5 - 9	3365	3570	4250	4790	5190	5060	4990
10 - 14	3966	3630	4280	4540	5040	5340	5350
15 - 19	4396	4280	4360	4570	4770	5170	5640
20 - 24	3897	4740	5130	4650	4800	4890	5460
25 - 29	3772	4200	5680	5470	4880	4930	5170
30 - 34	3479	4060	5030	6050	5740	5010	5200
35 - 39	2898	3740	4860	5360	6350	5890	5280
40 - 44	2439	3110	4470	5170	5610	6500	6200
45 - 49	2666	2610	3700	4730	5390	5720	6810
50 - 54	2786	2830	3080	3890	4900	5460	5960
55 - 59	3136	2700	2740	2990	3780	4780	5320
60 - 64	2955	3000	2590	2630	2870	3640	4600
65 - 69	2638	2770	2810	2430	2480	2710	3440
70 - 74	1918	2390	2510	2560	2220	2270	2490
75 - 79	1442	1660	2070	2180	2240	1960	2010
80 - 84	938	1130	1300	1640	1760	1830	1610
85 & up	837	1020	1240	1480	1850	2140	2350

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Consortium Series

City of Dover

	1980	1985	1990	1995	2000	2005	2010
0 - 4	1541	2090	2200	2090	1780	1600	1640
5 - 9	1580	1540	2090	2190	2090	1780	1590
10 - 14	1791	1570	1530	2090	2190	2090	1770
15 - 19	2979	1790	1570	1530	2090	2190	2080
20 - 24	3525	2960	1780	1570	1520	2080	2180
25 - 29	2042	3510	2950	1770	1560	1520	2060
30 - 34	1702	2030	3480	2930	1750	1550	1510
35 - 39	1421	1690	2010	3460	2910	1750	1540
40 - 44	1197	1410	1680	2000	3430	2890	1740
45 - 49	1075	1180	1380	1650	1970	3380	2850
50 - 54	1122	1040	1150	1350	1610	1930	3310
55 - 59	953	1070	1010	1100	1300	1560	1860
60 - 64	753	900	1010	950	1050	1230	1480
65 - 69	658	680	820	930	870	970	1150
70 - 74	479	580	600	710	810	770	860
75 - 79	316	400	470	490	600	680	640
80 - 84	206	230	290	360	370	460	520
85 & up	172	200	240	290	370	410	500
Totals	23512	24870	26260	27460	28270	28840	29280

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Population Projection System
Consortium Series

City of Dover

	1980	1985	1990	1995	2000	2005	2010
			MALES				
0 - 4	804	1070	1130	1070	910	820	840
5 - 9	776	800	1070	1120	1070	910	810
10 - 14	899	770	800	1070	1120	1070	910
15 - 19	1626	900	770	800	1070	1120	1060
20 - 24	2034	1610	890	770	790	1060	1110
25 - 29	972	2020	1600	880	760	790	1050
30 - 34	826	960	2000	1590	870	750	780
35 - 39	664	820	950	1980	1570	870	750
40 - 44	559	660	810	940	1960	1560	860
45 - 49	530	550	640	790	930	1930	1530
50 - 54	553	510	530	620	770	900	1880
55 - 59	421	520	490	500	590	740	860
60 - 64	357	390	480	450	470	550	690
65 - 69	263	310	340	430	400	420	500
70 - 74	192	220	260	280	360	340	360
75 - 79	108	150	160	200	220	280	260
80 - 84	71	70	100	110	130	150	190
85 & up	40	50	60	70	90	110	130
			FEMALES				
0 - 4	737	1020	1070	1020	870	780	800
5 - 9	804	740	1020	1070	1020	870	780
10 - 14	892	800	730	1020	1070	1020	860
15 - 19	1353	890	800	730	1020	1070	1020
20 - 24	1491	1350	890	800	730	1020	1070
25 - 29	1070	1490	1350	890	800	730	1010
30 - 34	876	1070	1480	1340	880	800	730
35 - 39	757	870	1060	1480	1340	880	790
40 - 44	638	750	870	1060	1470	1330	880
45 - 49	545	630	740	860	1040	1450	1320
50 - 54	569	530	620	730	840	1030	1430
55 - 59	532	550	520	600	710	820	1000
60 - 64	396	510	530	500	580	680	790
65 - 69	395	370	480	500	470	550	650
70 - 74	287	360	340	430	450	430	500
75 - 79	208	250	310	290	380	400	380
80 - 84	135	160	190	250	240	310	330
85 & up	132	150	180	220	280	300	370

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Population Projection System
Consortium Series

City of Newark

	1980	1985	1990	1995	2000	2005	2010
0 - 4	872	1430	1540	1440	1190	1030	1060
5 - 9	1006	900	1520	1540	1410	1170	1010
10 - 14	1255	1030	950	1520	1500	1390	1140
15 - 19	5576	5450	5530	5380	5830	5750	5570
20 - 24	6762	6520	6620	6360	6080	6530	6430
25 - 29	1682	2010	1660	1360	1060	900	1420
30 - 34	1261	1720	2130	1660	1320	1040	890
35 - 39	1146	1290	1820	2110	1610	1300	1020
40 - 44	965	1160	1360	1800	2060	1580	1260
45 - 49	886	980	1230	1340	1740	2000	1530
50 - 54	927	890	1010	1200	1290	1680	1920
55 - 59	859	910	900	980	1130	1220	1590
60 - 64	635	830	910	860	910	1060	1140
65 - 69	507	590	800	830	770	820	960
70 - 74	370	460	550	700	720	670	710
75 - 79	256	310	410	460	570	590	550
80 - 84	167	190	250	300	330	420	450
85 & up	115	160	210	250	300	360	440
Totals	25247	26830	29400	30090	29820	29510	29090

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Population Projection System
Consortium Series

City of Newark

	1980	1985	1990	1995	2000	2005	2010
			MALES				
0 - 4	468	730	790	740	610	530	540
5 - 9	526	480	780	790	720	600	520
10 - 14	633	540	510	780	770	710	580
15 - 19	2416	2360	2400	2330	2550	2510	2430
20 - 24	3245	3040	3100	2990	2860	3070	3030
25 - 29	892	1060	810	680	550	480	720
30 - 34	647	910	1120	810	660	540	470
35 - 39	565	660	960	1110	780	650	530
40 - 44	476	570	690	950	1080	760	630
45 - 49	432	480	600	680	910	1050	740
50 - 54	452	430	490	580	650	880	1000
55 - 59	430	440	430	470	540	610	820
60 - 64	303	410	430	400	430	500	560
65 - 69	197	270	380	380	350	380	440
70 - 74	144	170	240	320	310	290	310
75 - 79	79	110	140	190	240	240	220
80 - 84	52	50	80	90	120	160	160
85 & up	36	40	50	60	70	100	130
			FEMALES				
0 - 4	404	700	750	700	580	500	520
5 - 9	480	420	740	750	690	570	490
10 - 14	622	490	440	740	730	680	560
15 - 19	3160	3090	3130	3050	3280	3240	3140
20 - 24	3517	3480	3520	3370	3220	3460	3400
25 - 29	790	950	850	680	510	420	700
30 - 34	614	810	1010	850	660	500	420
35 - 39	581	630	860	1000	830	650	490
40 - 44	489	590	670	850	980	820	630
45 - 49	454	500	630	660	830	950	790
50 - 54	475	460	520	620	640	800	920
55 - 59	429	470	470	510	590	610	770
60 - 64	332	420	480	460	480	560	580
65 - 69	310	320	420	450	420	440	520
70 - 74	226	290	310	380	410	380	400
75 - 79	177	200	270	270	330	350	330
80 - 84	115	140	170	210	210	260	290
85 & up	79	120	160	190	230	260	310

University of Delaware
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Population Projection System
Consortium Series

City of Wilmington

	1980	1985	1990	1995	2000	2005	2010
0 - 4	5159	5250	5330	5450	4990	4620	4450
5 - 9	4839	5030	5130	5450	5390	4920	4510
10 - 14	5811	4720	4920	5240	5390	5320	4800
15 - 19	6543	5660	4610	5010	5180	5320	5180
20 - 24	5708	6360	5510	4680	4950	5090	5170
25 - 29	5868	5540	6190	5600	4620	4860	4950
30 - 34	4954	5690	5390	6280	5520	4540	4720
35 - 39	3578	4810	5540	5480	6200	5430	4410
40 - 44	3011	3460	4660	5610	5400	6080	5260
45 - 49	3042	2900	3330	4700	5500	5260	5870
50 - 54	3178	2900	2770	3330	4560	5320	5040
55 - 59	3837	2980	2720	2720	3190	4350	5030
60 - 64	3639	3530	2750	2630	2550	2990	4030
65 - 69	3682	3250	3150	2560	2390	2330	2700
70 - 74	2677	3150	2780	2830	2250	2090	2020
75 - 79	2199	2150	2540	2360	2340	1860	1720
80 - 84	1430	1600	1560	1960	1790	1780	1410
85 & up	1040	1330	1580	1760	2070	2120	2130
Totals	70195	70310	70460	73650	74280	74280	73400

University of Delaware
College of Urban Affairs and Public Policy
Census and Data System

Population Projection System
Consortium Series

City of Wilmington

	1980	1985	1990	1995	2000	2005	2010
			MALES				
0 - 4	2614	2690	2730	2790	2560	2370	2280
5 - 9	2449	2550	2630	2790	2760	2520	2310
10 - 14	2881	2390	2490	2680	2760	2720	2460
15 - 19	3186	2800	2330	2530	2650	2720	2650
20 - 24	2525	3090	2720	2360	2500	2600	2640
25 - 29	2667	2440	3000	2760	2320	2450	2520
30 - 34	2313	2580	2370	3030	2710	2280	2370
35 - 39	1625	2240	2500	2400	2990	2660	2210
40 - 44	1367	1570	2160	2530	2360	2920	2570
45 - 49	1398	1310	1500	2170	2470	2290	2810
50 - 54	1461	1320	1240	1490	2090	2370	2180
55 - 59	1668	1350	1220	1200	1410	1980	2220
60 - 64	1496	1500	1220	1160	1110	1300	1800
65 - 69	1409	1290	1290	1100	1020	980	1140
70 - 74	1025	1140	1040	1100	920	850	810
75 - 79	668	760	840	810	840	710	650
80 - 84	435	430	490	580	550	570	480
85 & up	271	330	350	410	470	490	500
			FEMALES				
0 - 4	2545	2560	2600	2660	2430	2250	2170
5 - 9	2390	2480	2500	2660	2630	2400	2200
10 - 14	2930	2330	2430	2560	2630	2600	2340
15 - 19	3357	2860	2280	2480	2530	2600	2530
20 - 24	3183	3270	2790	2320	2450	2490	2530
25 - 29	3201	3100	3190	2840	2300	2410	2430
30 - 34	2641	3110	3020	3250	2810	2260	2350
35 - 39	1953	2570	3040	3080	3210	2770	2200
40 - 44	1644	1890	2500	3080	3040	3160	2690
45 - 49	1644	1590	1830	2530	3030	2970	3060
50 - 54	1717	1580	1530	1840	2470	2950	2860
55 - 59	2169	1630	1500	1520	1780	2370	2810
60 - 64	2143	2030	1530	1470	1440	1690	2230
65 - 69	2273	1960	1860	1460	1370	1350	1560
70 - 74	1652	2010	1740	1730	1330	1240	1210
75 - 79	1531	1390	1700	1550	1500	1150	1070
80 - 84	995	1170	1070	1380	1240	1210	930
85 & up	769	1000	1230	1350	1600	1630	1630

S1975-3-a

DELAWARE POPULATION CONSORTIUM

POPULATION PROJECTIONS

1988 Version

Dover, Delaware
January, 1989

Summary of Projection Methodology

Introduction.

In 1975, a group of state and local agencies joined together in an attempt to bring some degree of sanity to the projection process. At that time, many of these agencies (or their consultants) produced separate projection series.

The problem faced by planners and policy makers alike was in choosing among the projection series available. This led to inconsistencies in the execution of policy where one set was used for traffic planning, another for water demand analysis, and a third for school enrollment or health planning. This is the same problem that was faced by DEFAC (Delaware Economic and Financial Advisory Council) in preparing revenue forecasts for the Governor and the General Assembly. Members of the General Assembly forced the abandonment of the range concept in favor of a "best guess" or "most likely" outcome. The general opinion was that ranges permit the manipulation of the data to fit the user's purposes. That was the guiding force behind the "joint" production of population estimates.

After producing projection series in 1975, 1978 and 1982, the Consortium decided to try to bring coherence to the employment projection series and more importantly, to make sure that the population forecasts and employment forecasts were consistent. The general logic was that you cannot have population growth without employment opportunity in the long-run. That decision led to the basic framework of the projection model that is currently used and is a departure from the more common approach which had been used prior to 1984.

In the final analysis, the quality of the projections depends on the quality of the assumptions chosen by those making the projections. In this paper we will explain the assumptions used and the projection process to which they are the primary input.

The Model.

The projection process begins with the 1980 age-sex distribution (obtained from the Census) for the jurisdiction being projected. This distribution begins with the five-year cohort 0-4 and ends with the 85&over age group.

The first step in the process is to age each age-sex cohort by five years. In doing so, a certain number of deaths must be accounted for. A five year survival rate is used to account for these deaths. Applying the survival rate to the 0-4 age group gives the number of those persons alive in that age group in 1980 that will constitute the 5-9 age group in 1985. This procedure is followed until all age groups have been filled with the exception of the birth cohort (0-4 in 1985).

The 0-4 age group in 1985 will be formed from all of those persons born during the 1980-1985 period. We estimate this by applying an annual birth rate for females in each separate age group beginning with 10-14 and ending with 45-49. The projected of births are then survived to 1985.

This procedure can then be applied for each subsequent time period 1985-1990, 1990-1995, and so on. The result would be an estimate with the assumption of zero net-migration. Unfortunately, that is rarely the case and thus we must attempt to account for migration.

The typical procedure used to adjust the projection for net-migration is to calculate a migration rate for each age-sex category for some past time period e.g. 1970-1980 or 1975-1980, and to make assumptions about how those rates will change in the future. In order to integrate the employment projections with the population projections we have chosen a variant of the usual procedure.

If we forecast employment using some economic model, then the population must be sufficient to provide the laborforce to fill that employment. If the current population is too low, net in-migration is forecasted. If the forecasted population is too high, out-migration will occur. In either case, the migration rates from the past are modified proportionally to permit the employment forecasts and the population forecasts to balance. These modified migration rates are then applied to the survived population for each five-year period. The actual amount of migration is an output of the calculation. If this number seems too high then adjustments must be made to the employment forecasts or to one of the other assumptions in the laborforce estimate.

This is the basic core of the model that was used to produce the attached projections.